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Photo. by [illegible]

Robert H Pickard

DR. ROBERT H. PICKARD, F.R.S.

PRESIDENT, SOCIETY OF CHEMICAL INDUSTRY, 1932–1933

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EDITORIAL

The Chemical Society's Discussions

TO-DAY we complete our account of the Chemical Society's discussion on "The chemistry of the sterols and bile acids," which took place on December 15; what appears in this issue of CHEMISTRY AND INDUSTRY should be read in conjunction with the opening paper as described in our issue of December 23. To apologize for delay would be to apologize for Christmas, and that we will never do; moreover we think that in important matters such as these the Society does well to await the receipt of attested copies of individual contributions before asking us to place the material on permanent record. Thus we are able to claim that our picture gives a faithful impression of a stage in the progress of chemical science; yet we are unfortunately unable to reproduce the atmosphere of alert criticism and stimulating activity which must have impressed itself on the minds of those able to attend the meeting. The recent discussion, opened by Prof. G. I. Finch, on "Combustion of gases in electric discharges" was equally a memorable occasion, and we look forward to similar scientific and polemic feasts when, on February 16, Dr. J. J. Fox opens a discussion on "The Raman effect in relation to some chemical problems" and, on March 16, Dr. G. F. Marrian opens a discussion on "The chemical constitution of œstrin." The policy of devoting certain ordinary scientific meetings to the discussion of a particular problem is one which quite evidently commends itself to the Fellows of the Chemical Society and their visitors; indeed it appears to us that the very success will accentuate anew the old difficulty of accommodation in the meeting room. For the discussion on the sterols the accommodation was taxed to capacity, and at the end of an unusually long meeting the chief complaint was that a single evening was insufficient for an adequate examination of the subject introduced in such a masterly way by Prof. Heilbron. The relation between cholesterol, ergosterol, and vitamin-*D* has already brought the subject into special prominence from the points of view of both organic chemistry and biology; additional interest resides in the considerable changes which opinions regarding structure have undergone during the past few months. But the biological interest is not confined to vitamin-*D*; it is directed also towards the relation of the sterols to the sexual hormones, to cardiac poisons, and to the production of cancer of the skin. As Dr. Rosenheim says, the new views, which have already made some contribution to the solution of the first of these problems, may be expected to stimulate further work in these directions. Thus by careful and prolonged experimentation, combined with judicious and well-informed, but none the less bold, speculation, science is gradually leading us to a clearer knowledge of the greatest and most elusive of all mysteries—ourselves.

Our First President

To-morrow numerous chemists, many learned societies, and several universities will pay tribute to the memory of one whose beneficent influence was as widespread as it was profound. The members of our Society in particular will salute the name of their first president, Henry Enfield Roscoe, for it was largely due to his wisdom, to that perspicacity which was perhaps his outstanding characteristic, that the Society of Chemical Industry was founded as a national institution rather than a parochial organization serving the interests of those engaged in the chemical industry in Lancashire. As chairman at the inaugural meeting, held in the rooms of the Chemical Society, Roscoe proposed "That a society for the advancement of chemical industry be and hereby is established." There can be no doubt that in putting forward his proposition Roscoe, with his penetrating vision, saw the trend of events and the urgent necessity for promoting the industrial side of chemistry in this country. That he visualized the day when the country would be shorn of much of its glory and power unless it quickened its energies, marshalled its forces, and husbanded its resources is to be seen in the presidential address which he delivered at the first annual general meeting of the Society. Had his recommendations been widely adopted, had the good seed fallen on a more receptive soil, many of the difficulties which faced the country during the last year of his life would have been removed. His disappointment must, however, have been relieved by the knowledge that at long last there was much evidence of that quickening influence which he had so strenuously advocated. As a mark of appreciation of the service he rendered to the industry and of the high esteem in which he was held by this Society he was awarded the Society's medal in 1914. Roscoe lived a full life: ample evidence of his unremitting industry is afforded by the variety and importance of his public engagements. Born in London on January 7, 1833, he was taken to Liverpool at a tender age, his father having been appointed Judge of the Court of Passage in that city. After attending the High School of the Liverpool Institute he entered University College, London, where he studied chemistry under the guidance of Graham and Williamson. Having obtained his degree, Roscoe realized the advantages which would accrue from a course of study on the Continent, especially in the stimulating atmosphere of Bunsen's laboratory at Heidelberg, to which he attached himself in 1853. From every point of view this was a most judicious

choice: it set the seal upon his career: it brought him in close contact with Kekulé, also with Lothar Meyer, Beilstein, Landolt, Baeyer, and other students who subsequently distinguished themselves: above all it enabled him to acquire familiarity with those methods which he was to turn to such good account at Manchester. When, at the age of twenty-four, Roscoe was appointed to the chair of chemistry at Owens College, the institution was in a state of collapse, so much so that the tenancy of a house was refused to him when the owner learnt that he was a professor in the college. Despite this inauspicious entry into professional life Roscoe never lost faith either in himself or his mission, hence he not only did much to preserve the foundation but was largely responsible for erecting the present superstructure - the University of Manchester. Of his many laudable ambitions, one that was very near his heart was "to make a school of chemistry worthy of the great manufacturing district of South Lancashire." That he achieved this object is common knowledge: in fact, his school, in which the first British chair of organic chemistry was established, was for many years without parallel in this country. In chemistry as in other matters Roscoe was primarily a man of action: towards the speculative side he was little inclined. Nevertheless he contributed largely to our stock of scientific knowledge; but if he had done nothing more than light the torch which was so ably carried to other institutions and laboratories by his old students his name would be remembered and revered. When, however, we recall his numerous extramural duties—the service he rendered to other colleges and to learned societies, the time he devoted to educational and State affairs—we can but admire his greatness. To recount in this commemorative note the part he played in the development of technical education is impossible; suffice it to say that his distinguished service in this field was acknowledged in 1884 by the conferment of knighthood. Realizing that in addition to all these labours he provided students of chemistry, both at home and abroad, with an extensive and much needed literature, one is amazed at his activity. Of his other exploits we must mention his Parliamentary representation of the South Manchester division. Elected in 1885 he represented that constituency for ten years, and throughout that period lost no opportunity of promoting legislative measures for reforming our educational system and ameliorating social conditions. Being aware that his attendance at the House of Commons would preclude him from carrying out his professorial duties he resigned the chair which he had occupied for close on thirty years. On vacating his seat in Parliament Roscoe returned to his old occupations with undiminished zest, rendering conspicuous service to numerous organizations and institutions, particularly to the University of London as senator and vice-chancellor and to the Lister Institute in the capacity of treasurer and chairman. Up to his death, which occurred on December 18, 1915, his interest in scientific and educational affairs never waned. In remembering Roscoe we remember his onerous and lofty mission. It is the measure of his greatness that the mission was not unworthily fulfilled.

A Hundred Years Ago

It is not without interest to compare our present conditions with those that prevailed a hundred years ago and we have already quoted in these columns the vivid and hopeful observations of Lord Macaulay. There was a great and rapid fall in prices after the Napoleonic Wars just as there was after the Great War; there was a short-lived rise in prices of quite a noteworthy amount in 1825 as there was in 1924 and 1925 again followed by a rapid fall to a level that had not been reached for very many years and things were at their worst about the year 1832 just as they were—we trust and believe—at their worst in 1932. A slow and gradual return to prosperity took place as we expect to take place now. In 1830 William Cobbett was making one of his famous Rural Rides and commenting in vigorous and abusive terms on many classes of people and many individuals. In his progress in Leicestershire he dwells on the evil effects of high taxation "In consequence of taxes people pay sixpence for a pot of worse beer than they could make for one penny; sevenpence for a pound of soap or candles they could have for three pence, six shillings for a pound of tea that they could have for two shillings; they pay double for their bread and meat of what they would have to pay if there were no idlers to be kept out of the taxes." When Cobbett came to Lincolnshire he wrote: "The people become so poor that the butchers killed no meat in the neighbourhood. I counted more than 2000 fat sheep lying about in the pastures in that richest spot in the whole world. Starvation in the midst of plenty; the land covered with food and the working people without victuals." He comments on the excellence of the grass land in Northumberland, Lancashire, and the West Riding of Yorkshire and contrasts it with the less nourishing grass of Hampshire "the land produces grass that fattens, everywhere where there is a sufficiency of grass it will fatten an ox . . . we know that we might put an ox up to his eyes in our grass and that it would only keep him from growing worse." Thanks to the researches on pasture land, mainly those conducted for so long by Imperial Chemical Industries we know now why some pastures are capable of fattening an ox and some are not and we know how at small expense to convert the latter sort into the former. No one has so far contrived a rapid method of converting the impoverished state of the industrial and agricultural world into a flourishing state. Perhaps if such a method existed some one would have thought of it by now. It does on the other hand seem probable that, as in the past, economy may be followed by a reduction of taxation and this by an increase in spending power and a reduction of the tariffs which impede the circulation of goods, a circulation that in the past has proved so profitable a business. It seems hardly likely that in this country we shall enjoy so large an export trade in manufactured goods as we once enjoyed, at any rate so great a proportion of the export trade of the world. We may be obliged to export less and to make and grow more for our own consumption; it is largely due to scientific research that this will be not only possible but easy.

PECTOGRAPHY: THE EFFECT OF COLLOIDS ON CRYSTALLIZATION

By JEROME ALEXANDER, M.Sc.

In a paper entitled "Pectography and the Constitution of Colloidal Solutions" published in this JOURNAL (1932, **51**, 25), Dr. E. S. Hedges applies a new and rather unfamiliar term to phenomena long known and reported under different headings or appellations. Dr. Hedges says that "very scanty attention has been devoted to the residues remaining after the dispersion medium has been removed from sols and gels," and the earliest reference mentioned in this connexion is the paper of Davies in J. Amer. Chem. Soc., 1922, **44**, 2705. It may not be amiss therefore, to draw attention to some earlier work along the same or very closely related lines, which is neglected, because it is mentioned incidentally in papers devoted to other topics, or else concealed by cryptic titles. I need only recall the experience of Prof. Richard Zsigmondy after his independent researches on colloidal gold. In his book "Zur Erkenntnis der Kolloide" (Jena, 1905) translated by Alexander as "Colloids and the Ultramicroscope" (Van Nostrand, 1909) he said (p. 75 *et seq.*): "To that group of chemists for whom it would have had particular interest, Faraday's pregnant work has apparently remained entirely unknown—until 1898. . . . It was only by a thorough search of the literature, which I undertook after the conclusion of my experimental work on this subject but before its publication, that I found Faraday's work which I rescued from the oblivion into which it had fallen."

Many common phenomena are regarded with unseeing eyes until some one points out their meaning, importance, and underlying causes. The effect of colloids on crystallization (or of crystalloids on colloids) is a matter of common observation. Thus many of the curious forms found in frost crystals on window panes show the directive effects of soap or of salt on the crystallization of water. These first came sharply to my attention on seeing some of the remarkable snow, frost, and ice figures of William Bentley in the *National Geographic Magazine* (1923), and led to a request that Prof. H. T. Barnes should write up a paper on Colloidal Water and Ice (Alexander's "Colloid Chemistry, Theoretical and Applied," Vol. I, 1926), wherein he makes reference to these effects and gives some of Bentley's pictures.

Many years previously, while investigating the effects of colloidal substances in milk and ice-cream, the marked effect of colloids on crystallization was reported in a number of papers. (J. Alexander, this JOURNAL, 1909, **28**, 280; Kolloid Zeitschrift, 1909, **4**, 86, **5**, 101; Colloid Chemistry, Vol. I, p. 624). Many unreported experiments showed the effect of a variety of hydrophile colloids on the residues left on evaporation of solutions of various salts and mixtures, and the following brief reference was made to some of these "pectographs" in a series of papers entitled "Colloidal State in Metals and Alloys" published in *Chemical and Metallurgical Engineering* in 1922: "The effect of colloids on the crystallization of ordinary salts is most remarkable and I hope to be able to publish further results of experiments along this line. Meanwhile I may say that with each salt, each colloid and each set of conditions (concentration, temperature, and pressure) there are formed characteristic groupings in which dendrites and spherulites are exceedingly common; also very beautiful and complicated leaf-like, branching, and cellular forms, reminding one forcibly of living structures. Indeed it seems evident that the growth and shape of living organisms are largely controlled by the complex interplay of the forces of crystalline growth, as restrained, modified, and directed by colloidal substances.

"If the amount of colloid is so small that it is all adsorbed by these structures before the salt has entirely crystallized, well-defined crystals of the colloid-free salt may appear. On the other hand, if enough of the colloid is present, ordinary visible crystallization may be entirely prevented; and in intermediate cases abortive attempts at crystallization register themselves in curious formations. The preparation of a few microscopic slides with solutions of NaCl, $MgSO_4$, Na_2SO_4 and Na_2CO_3, containing from 0·5% to 50% (figured on the dry salt) of gum arabic or gelatin, will give some idea of these effects* and show their striking resemblance to the microstructure of metals. The slides may be made by putting on a drop of the mixture and allowing it to dry without a cover glass. During the drying, changes in temperature and concentration occur within the drop, with the result that the field changes progressively from the centre."

In 1925 I chanced to see in a book-dealer's catalogue an offer of "The Effect of Colloids on Crystalline Form and Cohesion" by William M. Ord, the publication date being given as 1879. On securing the book I found to my surprise that this date was correct and that Ord's work was so far in advance of his time that it had been unappreciated and forgotten. Immediate attention was drawn to it (J. Alexander, "Science," 1925, **61**, 184). Dr. Ord was a physician in St. Thomas's Hospital, London, and owed his interest in colloids to his contact with Graham's pupils, if not with Graham himself. The originator of this particular work, according to Dr. Ord, was Mr. George Rainey, lecturer and demonstrator on anatomy at St. Thomas's Hospital, who in 1858 published a book entitled "On the Mode of Formation of Shells of Animals, of Bone, and of several other Structures by a process of Molecular Coalescence," in which he described the deposition of spherulites on microscope slides (see Ord, p. 3, *et seq.*). Prof. Harting of Utrecht had also done work along these lines (Ord, p. 6), and so had Prof. F. Guthrie (Ord, p. 8; Phil. Mag., 1878). Reference is also made to the much earlier work of F. Ascherson (Müller's Archiv for 1840, p. 44) which was reprinted by the Colloid Committee of the British Association for the Advancement of Science in "The Foundations of Colloid Chemistry," (Benn, 1925).

According to Ord (p. 26) three factors dominate bone formation: "(*a*) the nature of the colloid matrix; (*b*) the nature of the earthly salts; (*c*) the temperature of the body—the greatest compaction being attained

* "A mixture of Na_2CO_3 and NaCl crystallized in the presence of gelatin may form a 'flowering plant,' the Na_2CO_3 forming gracefully curved 'stems,' and the NaCl characteristic four-petaled 'flowers.'"

with albuminoid matrix, with a mixture of carbonate and phosphate, and with the highest temperature, as in the bird." The major portion of Ord's book, as its sub-title indicates, is devoted to the structure and mode of formation of the urinary and other calculi. Uric acid, urates, oxalate of lime, phosphates, carbonate of lime, and renal and biliary calculi are treated in separate chapters. Many illustrations show the curious and varied forms which appear on the interaction of colloids and crystalloids under various conditions, in the human body and its secretions and excretions.

What may be justly included under the term "pectrographs" are described at great length and with much detail in a paper by Prof. H. Schade in Alexander's Colloid Chemistry, Vol. II, pp. 803–844. This includes reference to much earlier work, and to such matters as the formation of shells, starch grains, oöliths, hailstones, etc. P. Le Comte du Nöuy in his paper, pp. 775–792 of the same volume, illustrates many "pectographs," using them to differentiate normal from immune serum. Dr. Raphael E. Liesegang, whose work in this field covers many years in the literature, has given a résumé of much of it in two papers—"Diffusion in Jellies" in Vol. I and "Colloid Chemistry in Geology" in Vol. III. In Vol. I, Prof. H. E. Holmes has a paper on "Reactions in Gels" (pp. 796–807) and H. A. Endres (*ibid.*, pp. 808–813) has one on "The Crystallization of Sulfur in Rubber." Dr. S. C. Bradford has one entitled "The Sol-Gel Transformation and the Properties of Jellies" (pp. 751–766) "pectographs" being illustrated on p. 761; papers in Vol. II by Stéphane Leduc (pp. 59–79) and A. L. Herrera (pp. 80–91) show many "pectographs."

Dr. Hedges (p. 25) in speaking of the view that colloidal ferric hydroxide sols seem to contain hydrophobic fibrillar particles and a hydrophilic inter-fibrillar cement, says: "The idea of 'autoprotective' colloids is thus evolved."

The terms "isocolloids" and "isocolloidism" were introduced about 25 years ago by Wolfgang Ostwald. Prof. J. Errera (Alexander, Vol. I, p. 510) defines isocolloids as "mixtures of more or less associated polymers"; but one must construe the term "polymers" broadly. In a paper entitled "Some Novel Aspects of Colloidal Protection" (J. Amer. Chem. Soc., 1917, **39**, 89), J. Alexander introduced the terms "plural protection," "autoprotection," and "cumulative protection," which are also described in a paper of the same title in Vol. I, pp. 619–627.

In conclusion the words of Ord may be quoted (p. 18): "Of the albumens, for instance, we know really little more than their rough chemical reactions; and though the reports of various societies embalm fragments of what may more properly be called their natural history, most of these fragments remain unnoticed or useless."

The correlation and co-ordination of knowledge must go hand in hand with its development. But when old wine is placed in new bottles, the old label should accompany it especially if a new one is also applied.

[A letter from Dr. Hedges in reference to this article appears on p. 13.—Ed.]

ROAD TARS*

Gone for ever are the days when we came back from a motor ride covered with dust. Since the advent of tar the hedgerows remain a poem of beauty throughout the year, and the thoughtful motorist ranks tar with tyre in his appreciation of the comforts of the road. At first any sort of tar sufficed, soon county surveyors became capricious and standards were demanded, and now there has arisen a technique of road tars which has necessitated scientific study and the setting up of all the customary paraphernalia of committees.

An important characteristic of tar used for the construction and maintenance of roads is the "consistency" which is alternatively described in the British Standard Specification for Tars (No. 76—1930) as the viscosity, although it has not hitherto been clearly proved that the two terms are equally applicable. Furthermore, it has remained open to question whether the term "consistency" has the same meaning when applied to the various grades of tar since the instruments specified for the measurement of this property differ for the different grades. Thus for a No. 1 tar consistency is measured at 30° C. with the tar viscometer, which is a modified form of the Redwood viscometer. The consistency of No. 2 tars is specified to be measured by the Hutchinson tar tester (junior model) at 25° C., whereas the more viscous No. 3 tars are to be examined on the tar viscometer, but in this case at the higher temperature of 35° C.

There is a tendency towards the use of tars of still higher consistency in road work, and in fact the border zone of "thick tar" and "soft pitch" has already been reached. This has increased enormously the difficulty of interpreting consistency in terms of a common measure, since it is the practice to characterize a pitch by one or more of a variety of tests such as the twist point, the fusion point, or the softening point. For the latter determination alternative methods are available, these being the modification of the Kraemer and Sarnow method and also the ring and ball method, which although standardized for use with asphaltic bitumens is finding increased favour in the tar industry.

An attempt to produce a common measure of this property of consistency for the various grades of tar and pitch led to the development of the Metro trough viscometer which has previously been referred to (Chem. & Ind., 1931, 476), and with the use of this instrument and the Metro plastimeter the consistency changes of tar and pitch with temperature were fully studied. The characteristic difference between an asphaltic bitumen as a pseudo-viscous material and pitch as a true fluid was also demonstrated. The firm foundation of the correlation of this property of "consistency" with the fundamental property of viscosity was however lacking, and the purpose of the present publication is to provide that foundation.

Using two different types of instrument capable of measuring the absolute viscosity of such a viscous material as tar, Mr. Pickard has shown that over a

* "The Measurement of the Viscosity of Coal Tars and Pitches," by H. Pickard. Published by the South Metropolitan Gas Company, 1932.

considerable temperature range the same general expression $CT^n = a$ may be used for correlating the viscosity-temperature relationships of tars as was used for correlating consistency-temperature changes, and that the "slopes" of the logarithmic temperature-viscosity curves very closely approximate to those of the logarithmic temperature-consistency curves obtained for the same tars with the Metro trough viscometer.

The degree of correlation of the various technical tar viscometers with each other and with the absolute viscometers is very fully explored and for this purpose reliance has not been placed solely on the use of horizontal retort tar, but the materials tested have included vertical retort tar, coke-oven tar, water-gas tar, asphaltic bitumen and tar bitumen mixtures, and most cautious step of all, Lyle's "Golden Syrup." Despite the variety of materials tested, the results indicate definitely that at any one temperature all the technical instruments tested may be regarded as measuring a function of this property of viscosity. In some cases, as with the tar viscometer and the Metro trough viscometer, the observed results of consistency may be multiplied directly by a simple factor to express them in terms of kinematic viscosity. In the case of the Hutchinson tar tester, a correction to the observed times must be made in order to allow for the buoyancy of the instrument: the corrected figures may then be correlated by a simple factor with kinematic viscosity. Particular attention is drawn to the point that the correlation of the results with one instrument at one temperature can only be made with a second instrument at a different temperature if the temperature-consistency characteristics of the tar are known.

The second part of the brochure deals similarly with the correlation of the absolute viscosity of pitch and "consistency" as measured by the Metro instruments, and "softening points" as variously recorded.

The fact that the viscosity of a horizontal retort pitch does not vary with wide variations in the rate of shear applied confirms the result already obtained with the Metro plastimeter that pitch has the characteristics of a true fluid. The logarithmic viscosity-temperature curve for pitch is shown to be linear over the wide temperature range of 70° F. to 205° F., and the determination of the characteristics of pitch by means of the Metro trough viscometer defines the temperature-consistency characteristics over a wide range. Finally the author demonstrates that with a number of different pitches softening point determinations whether made by the Kraemer and Sarnow method or by the ring and ball method, can be correlated with the results of consistency measurements made with the trough viscometer.

There is perhaps no material which at first sight is more intractable than pitch, and to have evolved an apparatus which measures its viscosity is no mean achievement. It is obvious that quiet progress is being made towards the upgrading of tar products; benzol at one end of the scale, pitch at the other are becoming more valuable, and it is to be hoped that the further development of the plastics industry will do something for the tar acids, which are surely possible of far greater utility to the community than is at present their lot. As always progress is intimately bound up with research, be it in the laboratories of Universities, firms, or trade associations.

E. F. ARMSTRONG

HORATIO BALLANTYNE

Mr. Horatio Ballantyne for a long period occupied a distinguished position in the patent world and had a great reputation as an adviser on chemical patents and inventions. He is now a managing director of Lever Brothers Ltd., a director of Unilever Ltd., and a director of Glycerine Ltd., and consequently occupies as important a position in the chemical industry as he formerly did in patent litigation. He was born in 1871 in Glasgow and was educated at the Garnethill School there and at the Glasgow and West of Scotland Technical College, now the Royal Technical College: he became assistant to R. R. Tatlock, the City Analyst of Glasgow from 1886 to 1896, and then set up as a consulting chemist in London: his great knowledge and the thoroughness of his work soon gave him a large practice and a good reputation. He combined a broad

view of his problems with the most careful attention to minute details and was remarkably successful. He is a Fellow of the Institute of Chemistry, a Member of the Royal Institution, and a Fellow of the Chemical Society. He married in 1899 Katherine I. Russell and has three daughters and some grandchildren. He has a house, garden, and orchard at Copt Hill Court, Burgh Heath; and he takes a great interest in his family and his domain. He has always been fond of scientific toys and has delighted his friends by demonstrations with Professor Boys' rainbow cup and other ingenious inventions. He is very hospitable and enjoys entertaining both young and old people and taking a part in all their games and amusements. He has also a serious side: he was Vice-President of the Institute of Chemistry and has served on several inter-departmental and other committees on Patent Law and Practice and has published learned and accurate papers on chemical subjects and on patents.

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Programme of Meetings for the Half-Session, 1933

Jan. 2. London Section. Joint meeting with Institution of Chemical Engineers. Burlington House, W.1, 8 p.m. "The Patents and Designs Act, 1932, and Chemical Industry," by C. Hollins.

Jan. 6. American Section. Grand Central Palace, New York, 8.15 p.m. Presentation of Parkin Medal to, and address by, George Oenslager.

Jan. 6. Manchester Section and Food Group. Joint Meeting. 17, Albert Square, 7 p.m. "The Conservation of Vitamins in Food Manufacture," by Prof. J. C. Drummond. "The Need for Standardization of Products containing Added Vitamins," by Dr. S. W. F. Underhill and Miss K. Culhane. "Factors Determining the Vitamin Content of Natural Products," by A. L. Bacharach.

Jan. 11. Montreal Section. Windsor Hotel, 8 p.m. (French Night.) "The New 'Université de Montreal' and its Chemistry Department," by Dr. Georges Baril.

Jan. 12. Birmingham and Midland Section. The University Buildings, Edmund Street, 7.30 p.m. Lecture by Dr. Alexander Fleck.

Jan. 12. Bristol Section. University, 7.30 p.m. Jubilee Memorial Lecture. "Alcohol Through the Ages," by *Dr. E. F. Armstrong, F.R.S.*

Jan. 13. Chemical Engineering Group. Burlington House, W.1, at 8 p.m. "Corrosion Research on Light Metals," by Freeman Horn.

Jan. 13. Newcastle Section. Armstrong College, at 7.30 p.m. Jubilee Memorial Lecture. "*Corrosion of Metals in Salt Solution and Sea Water,*" by *Dr. G. D. Bengough.*

Jan. 16. Yorkshire Section. "The Chemistry of the Calcification of Bone," by Prof. R. Robison, F.R.S.

Jan. 16. Edinburgh and East of Scotland Section. 36, York Place, 7.30 p.m. "Edinburgh Water Supply from Source to Tap," by *J. Bowman.*

Jan. 17. Birmingham and Midland Section. Midland Hotel Concert jointly with Institute of Chemistry and B.A.C.

Jan. 19. Nottingham Section. Derby Technical College, under the auspices of the Derby Chemists' Joint Committees on behalf of the Section and other bodies. "*Modern Chemical Plant,*" by *J. Arthur Reavell.*

Jan. 19. Glasgow Section. 39, Elmbank Crescent, Glasgow, at 7.30 *p.m.* Joint meeting with Scottish Junior Gas Association. "The Gas Industry," by J. W. Napier.

Jan. 20. Food Group. Joint meeting with Royal Sanitary Institute. At the Institute, 90, Buckingham Palace Road, S.W.1, 5.30 p.m. "*Factory Cleanliness in the* Food Industry," by E. B. Hughes.

Jan. 20. Liverpool Section. The University, 6 p.m. "The Functions and Training of a Chemical Engineer," by Prof. W. E. Gibbs.

Jan. 20. South Wales Section. Thomas's Café, High Street, Swansea, 7 p.m. "Some Recent Advances in Physical *Chemistry,*" *by Prof. J. E. Coates.*

Jan. 25. Montreal Section. *Dept. of Chemistry, McGill* University, 8 p.m. "Atomic Structure," by Dr. W. H. Barnes.

Jan. 27. South Wales Section. Technical College, Cardiff, 7.15 p.m. "Town Gas in South Wales Industries," by A. J. Cruise.

Feb. 1. Food Group. *Joint meeting with the Society of* Public Analysts. Burlington House, W.1., 8 p.m. "Changes taking place during the Storage of Fruits."

Feb. 2. Newcastle Section. Joint meeting with the Coke Oven Managers' Association and Institute of Chemistry. Armstrong College, at 7.30 p.m. "Buried Past and Hidden Future of Coal," by Prof. H. E. Armstrong, F.R.S.

Feb. 2. Birmingham and Midland Section. University Buildings, Edmund Street, 7.30 p.m. "Properties of Molecules as Learned from Surface Films," by N. K. Adam.

Feb. 2. Bristol Section. *Joint meeting with the Institute of* Fuel. University, 7.30 *p.m.* "Elimination of Dust and Sulphur from Flue Gases."

Feb. 3. Manchester Section and Plastics Group. Joint meeting with the Institution of the Rubber Industry. 17, Albert Square, 7 p.m. "Synthetic Resins and their Uses," by W. H. Nuttall.

Feb. 3. Glasgow Section. Royal Technical College, 7.30 *p.m.* Joint Meeting with Glasgow Chemical Societies. "The Appeal of Science to the Community," by Prof. A. Findlay.

Feb. 4. Birmingham and Midland Section. Midland Chemists' *Annual Dinner.—Dance.*

Feb. 6. London Section. *Burlington House, W.1, 8 p.m.* "Hormones," by Prof. E. C. Dodds.

Feb. 8. Food Group. Joint meeting with the Institute of Metals. Burlington House, W.1, 8 *p.m. Joint Discussion.* "The Use of Non-Ferrous Metals in the Food Industry." Speakers, T. N. Morris, J. M. Bryan, N. D. Sylvester, and others.

Feb. 8. Montreal Section. Windsor Hotel, 8 p.m. "Some *Newer Developments in the Refining and Utilization of Petroleum Products,*" by Dr. R. K. Stratford.

Feb. 10. Chemical Engineering Group. Burlington House, W.1. "Creep in Steels," by H. J. Tapsell.

Feb. 16. Edinburgh and East of Scotland Section. 36, York Place. "Incompatibilities in Medical Prescriptions," by J. Rutherford Hill.

Feb. 16. Nottingham Section. University College, 7.30 p.m. Series of Short Papers on "Problems I Have Met in Industry."

Feb. 17. South Wales Section. Details not yet arranged.

Feb. 17. Liverpool Section. University, 6 p.m. "Solid CO_2 and its Uses," by Dr. H. G. Littler.

Feb. 17. American Section. Chemists' Club, New York City. Joint meeting with other societies.

Feb. 20. Yorkshire Section. "Detection and Determination *of Small Amounts of Substances by Colorimetric* Methods," by N. Strafford.

Feb. 22. Montreal Section. McGill University, 8 p.m. "Chemistry of Foods," by Dr. D. L. Thomson.

Feb. 24. South Wales Section. Technical College, Cardiff, 7.15 p.m. "Stability of Cyclic Compounds," by Dr. F. J. F. Dippy.

Feb. 24. American Section. Grand Central Palace, New York, 8.15 p.m. "Water Purification for Commercial Application to Boilers," by A. T. Powell.

Mar. —. Food Group. Members' Evening. Details not yet arranged.

Mar. 2. Bristol Section. University. Annual Meeting, 7.30 p.m. Chairman's Address, "The Laboratory and *the Board Room,*" by *R. D. Littlefield.*

Mar. 3. Newcastle Section. *Armstrong* College, at 7.30 p.m. "Problems of the Paint Industry," by Noel Heaton.

Mar. 3. Manchester Section. Joint meeting with the Oil and Colour Chemists' Association. 17, Albert Square, 7 p.m. "The Accelerated Weathering of Paints and Varnishes," by Dr. V. G. Jolly.

Mar. 3. Glasgow Section. Royal Technical College, 6.45 p.m. Annual General Meeting followed by the Cinematograph films, "Modern Asphalt Pavements" and "The Story of a Sheet of Paper."

Mar. 6. London Section and Plastics Group. Burlington House, W.1, 8 *p.m.* "*Plastics with Special Reference* to Cellulose Materials," by Dr. W. J. Jenkins.

Mar. 7. Chemical Engineering Group. Joint Meeting arranged by Institution of Automobile Engineers with other societies. Paper by H. R. Ricardo, F.R.S.

Mar. 8. Montreal Section. Joint meeting with Montreal *Paint and Varnish Club. Windsor Hotel, 8 p.m.* "Raw Materials in the Paint, Varnish, and Lacquer Industries," by Dr. J. B. Wiesel.

Mar. 10. American Section. Chemists' Club, New York City, Nichols' Medal. Joint meeting with other chemical societies.

Mar. 16. Nottingham Section. University College, 7.30 p.m. "*The Riddle of the Roll Film,*" by Dr. H. Baines.

Mar. 17. South Wales Section. *Technical College, Cardiff,* 7.15 p.m. Annual Meeting.

Mar. 17. Birmingham and Midland Section and Chemical Engineering Group. Joint meeting. The University Buildings, Edmund Street, 7.30 p.m. "Personnel in Industry," by W. A. S. Calder.

Mar. 17. Liverpool Section. University, 6 p.m. "Scientific Disarmament and Security," by Major V. Lefebure.

Mar. 22. Montreal Section. Dept. of Chemistry, McGill University, 8 p.m. "The Physical Chemistry of Colloidal Systems," by Dr. E. W. R. Steacie.

Mar. 23. Edinburgh and East of Scotland Section. North British Station Hotel, 7.30 p.m., Annual General Meeting. 8 p.m., "Drikold," by Dr. Littler.

Mar. 27. Yorkshire Section. Annual General Meeting.

Mar. 27. Yorkshire Section and Plastics Group. Joint meeting, Leeds. "The Industrial Uses of Rubber Latex," by Dr. D. F. Twiss.

Mar. 28. Edinburgh and East of Scotland Section. Invitation from Institute of the Rubber Industry to attend lecture "The Chemist in Industry—Research, Realization, and Reward," by Dr. J. E. G. Harris.

Apr. 3. London Section. Burlington House, W.1, 8 p.m. "Modern Methods of Examining Pictures," by Prof. A. P. Laurie.

Apr. 6. Birmingham and Midland Section. The University Buildings, Edmund Street, 7.30 p.m. (Annual Meeting.) Paper on "Refractories," by C. R. F. Threlfall and A. T. Green.

Apr. 6. Bristol Section and Food Group. Joint meeting. University, 7.30 p.m. "Problems of the Cider Maker." Afternoon visit to Long Ashton Fruit and Cider Research Station.

Apr. 7. Liverpool Section and Chemical Engineering Group. Joint meeting with Institution of Chemical Engineers. University, 6 p.m. "The Corner Metals of Electrical Distribution—Copper, Aluminium, and Lead," by Dr. F. J. Brislee. Afternoon visit to the Central Electric Generating Station, Clarence Dock.

Apr. 7. Manchester Section. 17, Albert Square, 7 p.m. Annual General Meeting. Textile Symposium.

Apr. 12. Montreal Section. Windsor Hotel, 8 p.m. Annual Business Meeting. Subject of paper to be announced later.

Apr. 14. American Section. The Chemists' Club, New York City. Joint meeting with other chemical societies.

Apr. 26. Plastics Group. Annual General Meeting.

Apr. 28. Chemical Engineering Group. Annual General Meeting. Programme to be arranged.

May 1. London Section. Burlington House, W.1, 8 p.m. "Recent Developments in Metallurgy," by Prof. C. H. Desch, F.R.S.

May —. Edinburgh and Glasgow Sections. Joint Scottish Meeting in Glasgow.

May 12. American Section. Grand Central Palace, New York, 8.15 p.m. Programme to be arranged.

May 24. Food Group. Annual General Meeting in London, followed by Exhibition of Technical Cinematograph Films. Details to be announced.

June 2. American Section. The Chemists' Club, New York City. Joint meeting with other chemical societies.

July 10—14. Society's Annual Meeting in Newcastle-on-Tyne.

Chemical Engineering Group
Food Group
Plastics Group
} Session to be arranged by each Group.

Conditions and Privileges of Membership

The Annual Subscription of £2 10s. is due on January 1.

Resignation of membership must be made in writing before December 31, otherwise the following year's subscription becomes due.

Where the subscription for the current year remains unpaid at the end of January the weekly supply of the JOURNAL ceases forthwith. Back numbers will be made good when the subscription is paid.

British Chemical Abstracts "A" (Pure Chemistry) are issued (post free) to members at £2 instead of the usual £3 13s. 6d. Applications must be made to the Assistant Secretary, The Chemical Society, Burlington House, London, W.1.

Extra copies of the "B" Abstracts (as printed in the JOURNAL) may be obtained, for member's own use only, printed on one side of the paper (gummed or plain), on application to the Secretary at Central House, Finsbury Square, E.C.2, for £1, payable in advance.

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Members of this Society are entitled to make use of the Library of the Chemical Society at Burlington House, Piccadilly, W.1.

The JOURNALS from which the "B" Abstracts are made, and of which a list is published in the Index to Abstracts, may be consulted or borrowed in many cases on application to Central House.

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Every member of the Society is automatically attached to the local Section nearest his residence, but is also entitled to belong (without further fee) to any other desired Section on making his wishes known.

All orders for publications supplied by the Society must be prepaid. Back numbers of the JOURNAL with very few exceptions, can always be provided at a cost per copy of 1s. 10d., post free.

Reprints of most of the papers appearing in "Transactions" may be had at a cost of 1s. per copy.

Claims for non-delivery of the JOURNAL or other publications must be posted within two weeks of the due date of arrival—otherwise replacements must be paid for at the usual single copy rate.

The Index to the JOURNAL and the Index to Abstracts will not be ready for distribution till March: they will then be posted to every paid-up subscriber of 1932.

Favourable arrangements for the supply of cases for binding the various sections of the JOURNAL have been made with Messrs. Gurney & Jackson, 33, Paternoster Row, London, E.C.4, and of Tweddale Court, Edinburgh, to whom all enquiries should be made direct.

Any member may join the Chemical Engineering Group at an extra yearly subscription of £1 1s. Membership of the Food Group or Plastics Group entails no fee.

SOCIETY OF CHEMICAL INDUSTRY

OFFICIAL NOTICES

Australasian Subscriptions (*New Zealand included*) may now be paid by members direct to the Society's account at the Commercial Bank of Australia, 273, George Street, Sydney. Receipts will be issued in due course. This arrangement has been authorized by Council to save members loss on exchange during the period of depressed currency. *The bank cannot conduct correspondence on any matters other than the mere receipt of payment.*

General Information. Attention is called to the information on the Society's activities published on pp. 6–9 of this number. The General Secretary receives in the course of the year many inquiries on points already fully exposed in these pages. If their incidence in the first number of each year be memorized their utility will be increased. Reprints may be had free on application to the Secretary.

Changes of Address *should be notified promptly.*

Subscriptions for 1933 are now due and the amount £2 10s. or $12·30 at normal rate of exchange should be sent to 46, Finsbury Square, without delay.

OTTAWA SECTION

Co-operation in chemical research was the subject of an address delivered by Mr. F. E. Lathe, Director of the Division of Research Information of the National Research Council, at the December meeting of the Ottawa Section of the Society of Chemical Industry. The meeting was the first held in the new National Research Laboratories and many of the members improved the opportunity to inspect the chemical laboratories operated under Dr. G. S. Whitby, Director of the Division of Chemistry.

To co-operation in research the speaker ascribed a large part of the success which the Council had achieved in its activities to date. Until five years ago, he pointed out the Council was entirely dependent on outside laboratories for its research work. Through grants in aid of research to university professors and other research workers it had provided them with special equipment and technical assistants, and through its associate committees had brought together in consultation experts on those problems which it was proposed to investigate. By drawing up a comprehensive programme of research on problems of major importance and assigning specific phases of the investigation to particular research workers it had been possible to stimulate research effort and largely co-ordinate research work throughout Canada. To Dr. Tory, President of the Council, the speaker paid a tribute for his outstanding part in this development. Now that the National Research Laboratories have been completed the Council was able to assume a much larger part in the actual investigations being carried out under this plan, but support to outside bodies was being continued.

Referring in particular to the Council's associate committees the speaker outlined the activities of the advisory committee of chemists and stated that it was proposed to form a committee on chemical standards. He then described the work of the Council's committees whose activities involved chemical research, mentioning in particular those on asbestos, coal classification, gas, grain, honey, iodized salt, laundry and leather research, magnesian products, smelter smoke, weed control, and wool. While most of these committees had not been operating more than two or three years nearly all had secured results of material value to industry or agriculture. It was of interest to note that some of the products recently developed were finding a profitable market in spite of the depression.

Stress was also laid upon the fact that the Council was as far as possible bridging the gap between laboratory research and commercial application. As an example, it was stated that the plastic magnesia for the floors of the new research building, a result of laboratory investigations, had been manufactured on a commercial plant under the direction of a member of the staff, and the floors themselves had been laid under the supervision of the staff in accordance with procedure developed in the laboratory.

In rising to propose a vote of thanks to Mr. Lathe for his address, Mr. M. L. Davies, President of the Canadian Chemical Association, grasped the opportunity of speaking at some length on the aims and progress of the Association. He stressed the breadth of its appeal to the chemical world of Canada, to the purely academic man, to the commercial man, and to the industrialist, comparable in a manner to the catholicity of the Kingdom of Heaven, a replica in the Dominion of the Society of Chemical Industry throughout the world.

Mr. Davies also spoke of the enthusiasm he had met with in the course of his trips to various sections mentioning a new group in Western Ontario whose members came comparatively long distances to attend meetings in winter weather and concluded by an appeal to the rank and file to do their part in making the work of the Association a success by coming in large numbers to Quebec in June to take part in the splendid convention that was being prepared.

At the close of the meeting refreshments were served by a committee under the convenership of Miss M. E. Whalley.

CHEMICAL SOCIETY

The following is an account of the discussion which took place on December 15, 1932, on " The Chemistry of the Sterols and Bile Acids." A report of Prof. I. M. Heilbron's opening paper has already been published (This JOURNAL, 1932, *p.* 1061).

Prof. T. M. Lowry said that the formula now suggested did not account for the well-known optical properties of ergosterol and was therefore just as definitely inadequate as a formula would be which omitted to provide an asymmetric carbon atom to account for its optical activity. Formula VIII shows a hydroxyl-group and three detached olefinic groups, associated with a complex skeleton which contains no other unsaturated or chromophoric group. Such a compound would be expected to be transparent throughout almost the whole of the accessible ultra-violet region, since none of these groups has any appreciable absorptive power at wavelengths greater than 2327 Å. Thus allyl alcohol shows a very weak step-out at about 2200 Å, which may perhaps

be attributed to the olefinic group, and a rapid increase of general absorption at about 2000 ., for which the alcoholic group is perhaps responsible. Conjugation of two olefinic groups in isoprene or in dimethylbutadiene converts the step-out into a fairly strong band at 2300 Å.; and in *cyclo*pentadiene this band is shifted to 2400 Å.; but the mere conjugation of two olefinic bonds produces nothing comparable with the observed absorption of ergosterol. In order to account for the group of absorption bands at about 2800 Å., therefore, it appears to be necessary to correlate three of the four chromophoric radicals of ergosterol, of which the olefinic group in the side-chain is obviously too remote from the hydroxyl to be used for this purpose.

A search of the literature has disclosed the fact that the absorption spectrum of phenol shows a surprising and unexpected similarity to that of ergosterol. Thus Victor Henri's curve for a solution of phenol in hexane includes two principal maxima at about 2780 and 2700, a subsidiary maximum at 2650 and indications of two others at about 2810 and 2570. Bourdillon's curve for a solution of ergosterol in hexane or alcohol shows two principal maxima at wave-lengths 2810 and 2720 which are almost identical with those of phenol, together with a subsidiary maximum at 2920, and a slight inflexion at 2670. The curve for ergosterol, as recorded by Bowden and Snow with the help of the continuous spectrum of a hydrogen arc, shows five absorption bands and thus corresponds even more closely with Henri's curve for phenol. There can therefore be little doubt that ergosterol has the fundamental optical characteristics of a phenol and should be represented by a formula in which the hydroxyl-group is associated as closely as possible with a pair of conjugated double bonds.

[Communicated 20.12.32. Unpublished observations by Bowden and Snow have shown that the characteristic absorption of ergosterol is destroyed completely by the addition of two atoms of hydrogen in dihydroergosterol. This change recalls the difference between the spectra of phenol and allyl alcohol, and provides independent evidence of the presence in ergosterol of a conjugated system which is broken up when two atoms of hydrogen are added, presumably at the ends of the conjugated chain.]

Mr. J. D. Bernal said: The examination by the methods of X-ray and optical crystallography of about thirty derivatives of sterols and bile acids as well as of the hormone œstrin has shown that the great majority of these substances form crystals with the same fundamental pattern. This indicates a common molecular skeleton fitting in a space of approximate dimensions $4 \cdot 5 \times 7 \times 20$ Å. The thickness of 4·5 Å. is compatible only with an approximately flat condensed ring system and by itself rules out the old sterol formula. The 20 Å. length fixes the side chain as forming an extension of the ring system distally placed to the hydroxyl-group. The Rosenheim–King formula slightly modified fits all these requirements.

The hydrogenated hydrocarbons derived from the sterols by Diels have been examined and compared with that prepared from strophantidin by Jacobs and with retene, phenanthrene, chrysene and its reduction products. Both Diels' hydrocarbon "$C_{18}H_{16}$" and Jacobs' "$C_{16}H_{14}$" show the closest resemblance to retene $C_{18}H_{18}$ and to each other. The constitution of the former is probably $C_{16}H_{14}$ or $C_{17}H_{15}$, but the doubtful purity of the material and the small amounts available make any assumptions as to structure beyond the existence of a phenanthrene nucleus premature. The structure of ring IV of the sterols is therefore still in doubt.

The X-ray measurements do not give direct evidence of the positions of the double bonds in ergosterol, but the comparison of the structures of ergosterol, anhydrous and hydrated, with dihydroergosterol, the ergostenols and corresponding cholesterols suggests that the most unstable double bond lies near the hydroxyl-group. The violently hygroscopic character of ergosterol reinforces the impression that the hydroxyl here has a quasi-phenolic character. There is no evidence for bridge rings in α- or β-ergostenol.

Prof. R. Robinson said that he proposed to deal with one point only but did not wish to neglect the opportunity of congratulating Drs. Rosenheim and King on having supplied the spark which has led to such a notable bonfire of unseemly molecular structures. Prof. Heilbron has shown in masterly fashion the growth of new and more beautiful sterol formulæ.

The assumption that lithobilianic acid and *iso*lithobilianic acid must be stereoisomerides was based on a cast-iron argument but one link in the chain has recently been shown by Windaus to be not merely weak but actually missing. With the discovery that coprosterol may be oxidised in stages to lithobilianic acid the whole matter becomes clarified and no difficulties in the way of the new structures remain.

The fact that the dicarboxylic acid obtained by breaking ring 1 in coprosterol is readily converted into a ketone whereas the dihydro-Diels acid gives the same ketone far less readily, proves that coprosterol, the cholic acids, and pseudocholestane are *cis*-decalols; cholestane, dihydrocholesterol, and *allo*cholanic acid must be *trans*-decalols. Similarly dihydro-Diels acid and stadenic acid are *trans*-derivations. It is obvious that the terms allo- and pseudo- are no longer capable of consistent logical interpretation in this series. There is no relation between *allo*cholesterol and *allo*cholanic acid; also *pseudo*cholestane possesses the normal or natural configuration whilst cholestane only arises as the result of reduction of a double bond. Similarly *pseudo*cholestane and *pseudo*cholestene are not related in the sense that the prefix means the same thing in the two compounds. The position of the methyl group in ring IV (D) is apparently based only on the failure to esterify a carboxyl group which is doubtless attached to C_{13}. But if the methyl be placed at C_{14}, as the speaker prefers, the carboxyl at C_{13} is still under the steric influence of heavy substitution in the two adjacent (*ortho*-) positions. At C_{14} the methyl allows isoprene units to account for fifteen carbon atoms, the remainder being in a straight chain.

Dr. O. Rosenheim wished to associate his collaborator, Dr. H. King, with the following remarks: The chemistry of cholesterol and the bile acids has now reached a stage in which the filling in of details is all that is required to complete the picture of their constitutional formulæ.

The exact position of two double bonds in ring II (or III ?) of ergosterol remains still to be established. The intense U.V. absorption of ergosterol necessitates a system of conjugated double bonds, and for this reason alone the position 5, 6—8, 9 chosen by Prof. Heilbron is unacceptable. The biochemical origin of sterols and bile acids is still a matter of conjecture, but by transferring the Me group from C_{13} to C_{14}, in accordance with Prof. Robinson's suggestion, it is possible to accommodate in our new formula two straight-chain carbohydrate molecules (a hexose and a methylpentose) together with three isoprene units, joined in the usual manner.

The outstanding problems to be solved are essentially connected with biochemical problems. The importance of sterols in metabolic processes is shown, apart from their connexion with calciferol (vitamin-*D*), by their relation to the sexual hormones, to the cardiac poisons of animal and vegetable origin (bufotoxin, digitoxin, strophanthin, etc.) and by their possible function in the production of cancer of the skin. The new formula may be expected to stimulate further work on these problems and has already proved useful, as anticipated by us, in affording a working hypothesis with regard to the constitution of sexual hormones. It has also made it possible to formulate the consecutive production, under the influence of U.V. rays, of the five known isomerides of ergosterol, of which one only has antirachitic activity. Three changes at least are taking place, the first being epimerisation of the OH group. The second is connected with migration of ethenoid linkages, and finally a migration (or its prevention) of CH_3 groups possibly leading to *cis-trans* re-arrangements, has to be taken into consideration

We have recently obtained experimental evidence demonstrating the close relationship between sterols and the cardiac glucosides, which has for some time been assumed to exist. A striking resemblance has been found in the ultra-violet absorption spectra of the hydrocarbons $C_{16}H_{14}$ and "$C_{18}H_{16}$" ($C_{16}H_{14}$?) obtained from strophanthidin and sterols respectively by dehydrogenation with Se. Their spectra closely resemble, on the other hand, that of retene (1-methyl-7-*iso*propylphenanthrene). Evidence obtained by U.V. absorption measurements demands cautious interpretation, as is clearly shown by previous experience with sterol derivatives. When it is supported, as in this case, by the confirmatory evidence of *X*-ray measurements, it seems permissible to draw the conclusion that the two hydrocarbons obtained from strophanthidin and sterols are substituted phenanthrenes. This conclusion supports the new sterol formula, which contains a reduced phenanthrene ring system. Additional evidence in this respect is provided by the similarity of the absorption spectra of neoergosterol and dodecahydrochrysene, in both of which ring II (or III) is aromatic.

We understand that the possible carcinogenic function of the hydrocarbon $C_{25}H_{24}$, obtained by dehydrogenation of sterols, is being investigated. It has probably the formula $C_{26}H_{24}$, which is in good agreement with the recorded analytical results, whilst its constitution can be readily arrived at from the new sterol formula. *X*-Ray measurement and optical properties are in accord with the constitutional formula suggested.

Dr. N. K. Adam said: A large number of measurements have been made on unimolecular surface films of sterols and their derivatives, of both surface pressure and surface potential (cf. Schulman and Rideal, Proc. Roy. Soc., **A**, **130**, 259; Adam and Harding, *ibid.*, **138**, 411), in continuation of the work of Adam and Rosenheim (Proc. Roy. Soc., 1929, **A**, **126**, 25; **B.**, **105**, 422). The common sterols form incompressible films, of area between 37 and 40·5 sq. Å. per molecule, in which the molecules are almost certainly upright and closely packed on the surface. This area is found from models to be approximately the cross-section of a sterol formula made up according to Rosenheim and King's formula. The older formulæ for the sterol skeleton require a cross section of at least 54 sq. Å. Rosenheim and King's formula admits of a number of different stereochemical configurations; the above areas are for the configuration in which the rings are as nearly as possible in one plane, the maximum distance of the centre of any carbon atom being 3/4 Å. from the main plane of the rings. The minor differences between the areas of films of different sterols are possibly due to stereochemical differences in the skeletons.

The irradiation products of ergosterol occupy greater areas than ergosterol, the increase in area reaching a maximum at calciferol. As one of the suprasterols and pyrocalciferol occupy smaller areas than calciferol, it appears that prolonged irradiation or the action of heat on calciferol tends to produce substances occupying a smaller area in the films. The increased area is here unquestionably due to tilting of the molecules in the surface films. Although the causes of tilt in surface films are not yet fully understood, there are several reasons for supposing that, during irradiation of ergosterol, changes of position of the double bonds occur, and probably also stereochemical changes in ring *A*, of such a nature as to alter the inclination of the dipole of the hydroxyl-group to the plane of the rings. Evidence for alteration of the inclination of the hydroxyl-group is found in the different values of μ (the vertical component of the change in dipole moment in the surface, per molecule, produced by the film) for ergosterol and calciferol, and also for the dinitrobenzoates of these substances. Clear evidence of changes in the arrangement of the double bonds, during irradiation, is found in the behaviour of the different products when spread on permanganate solutions. A definite stage of oxidation, probably corresponding to the introduction of two hydroxyl-groups, is obtained under comparable conditions at very different speeds, with ergosterol and its various irradiation products. The areas occupied in this stage of oxidation also vary considerably.

The behaviour of cholestenone and its oxime in the films is puzzling. Cholestenone forms a film of 50 per cent. greater area than cholesterol, the molecules being obviously much tilted. The oxime forms a film in which the molecules are nearly, but not quite, tilted back again to the vertical arrangement given by cholesterol. A complete explanation of these changes must be deferred till the forces producing tilt in the molecules are better understood. The dipoles in the polar groups of the film molecules may interact with the

general electrical field of the water surface, producing the anchorage which stabilises the film, and there are, no doubt, also complex interactions between the dipoles of adjacent molecules. The relative magnitude of these different forces may produce a wide range of tilt.

Pseudocholesterol and oxycholestenone give films indicating a strong anchorage to the water, that is, a polar group, in ring B; oxycholesterylene forms a film of decidedly smaller area, which is perhaps most easily explained if the ketonic group is in position 4 in ring A; position 6 in ring B appears, however, just possible. (N. K. Adam and J. F. Danielli.)

CORRESPONDENCE

PECTOGRAPHS AND THE INFLUENCE OF COLLOIDS ON CRYSTALLINE FORM

SIR,—I have been interested to read Mr. Jerome Alexander's article on the influence of colloids on crystalline form. This is a subject which I have treated at some length in my recent book "Liesegang Rings and other Periodic Structures" (Chapman & Hall, London, 1932) and in several other publications. In the article of mine to which Mr. Alexander refers I discussed the deposition structures formed by the colloid itself in the absence of crystalline matter, to which Bary has given the name of "pectograph."

Mr. Alexander's "discovery" of Ord's book dated 1879 appears to have been anticipated, for Hepburn directed attention to it in 1923 (*Nature*, 1923, **112**, 439) and I mentioned it in my book "The Problem of Physico-Chemical Periodicity," published in 1926.

I do not think that Bary's view of "autoprotective colloids" bears any relation to Ostwald's conception of "isocolloids."

I am, Sir, etc.,

ERNEST S. HEDGES

London, W.C.

CHEMICAL PUBLICATIONS

SIR,—The discussions in your columns dealing with the desirability of confederating certain of the chemical societies in Great Britain have emphasized the question of economy, and it is this aspect of the discussions which makes, I venture to think, special appeal to overseas members of the societies.

An overseas member receives a less adequate return for his outlay than a home member does, or at least can receive. This is unavoidable, not a matter of contention, but there is one way in which a confederation could begin to effect a very definite recompense to overseas members, and that is in the matter of providing them with the class of current literature they desire.

Home members probably have very little idea of the disadvantages imposed on overseas members by the multiplicity of journals issued, the diffuseness, and occasionally the irrelevancy, of their contents, and the impossibility of access to more than comparatively few of them.

The formation of groups, within or without the major chemical societies, groups intent on the intensive study of some phase or application of chemistry, has much to recommend it, but the publication by each group of a separate set of "Transactions," or whatever it may be called, restricts the financial capabilities, the audience, and the ultimate scope of usefulness of the group and its individual members.

Consider the case of a worker who is interested especially in, say, the study of refractories. To provide himself first-hand with current literature he would need to subscribe to the journals of two chemical societies, to at least half-a-dozen journals specializing in fuel, glass technology, steel, etc. and a few journals of general interest. From these publications he would learn the names (and subscription rates) of an equally long list of foreign journals which occasionally publish papers on refractories. He could hardly escape coming to the conclusion that the present method of publication of current scientific knowledge is distinctly directionless and very uneconomic.

Cannot the ability which gives us so many publications excellent as such, devise some systemization of current literature, or at least make some attempt to prevent the situation becoming worse and worse yearly?

W. TERNENT COOKE

Adelaide
Nov. 28, 1932

VACUUM DESICCATORS

SIR,—On reading Prof. Gibson's interesting letter in the JOURNAL of December 23, describing an explosion which occurred during the use of an evacuated desiccator, I am tempted to refer briefly to a similar accident which I witnessed several years ago.

In this case the desiccator, which had been in frequent use, was made of ordinary glass but was otherwise of much the same size and shape as that referred to in the above letter. On the occasion in question it was being evacuated by a water pump when the lid collapsed inwards giving rise to an explosion of extreme violence. Although the body of the desiccator survived the explosion, large jagged pieces of glass from the lid rebounded out across the laboratory doing considerable damage to adjacent apparatus. The violence of the explosion can be understood when it is said that although the desiccator had contained a number of small beakers (50 or 100 c.c. size) no trace of any of these could be found in the wreckage. Indeed if anybody had been standing over the desiccator at the time of the explosion they would certainly have been killed.

I trust that these brief remarks are of interest and feel that our thanks are due to Prof. Gibson for emphasizing the danger attending the evacuation of very large desiccators.

I am, Sir, etc.,

JASON T. W. MANN

Bexley Heath, Kent
Dec. 29, 1932

PERSONAL AND OTHER ITEMS

The following higher degrees have been awarded in the University of London:—*Ph.D.*: (chemistry) W. Gerrard, I. W. H. Harris, A. H. J. Houssa, H. Nichol; (biochemistry) D. H. Hall; (fuel technology) J. Mendelsohn; *D.Sc.* (biochemistry) D. C. Harrison.

Mr. John Gray, one of the oldest members of the Society, and President in the year 1919—20, who died on September 25, 1932, left estate of gross value £110,283, with net personalty £105,106.

Mr. H. T. Tizard, C.B., F.R.S., Rector of the Imperial College of Science, has been appointed chairman of the Aeronautical Research Committee in succession to Sir Richard Glazebrook, K.C.B., F.R.S., with effect from April 1 next.

We record with great regret the death in October last of Dr. Marcus Benjamin, an original member of the Society and one of the most distinguished members in America. Dr. Benjamin was born in 1857 and educated at Columbia University, taking the degree of Ph.B. in 1878. He worked for some time as an analyst in the U.S. Customs Service, and lectured on chemical subjects, then turned his attention to writing, becoming noted for a number of publications and contributions to technical journals. He edited the "History of the Smithsonian Institution" for 34 years, and was editor also of the U.S. National Museum Science publications. He was a life member of the American Association of Science, of which he was acting president in 1899, and was honoured by awards from the French and Italian Governments, and several universities in America.

We regret to announce the death on December 28 of Mr. William A. Williams, F.I.C., F.R.S.E., works manager of the North British Rubber Co., Ltd., of Edinburgh, following several months of ill-health. Mr. Williams was an acknowledged authority on matters connected with rubber, and he was the 1932 Streatfeild Memorial Lecturer of the Institute of Chemistry, taking "Rubber" as his subject, the lecture having been given in his absence on November 18 last. All those who were privileged to come into contact with him in business knew him for a capable and hard worker, whilst he contributed much of his time and energy to the welfare of this Society. Joining the Society in 1918 he soon began to take an active part in the work of the Edinburgh Section, and served as chairman of the Section from 1925 to 1927. The loss to the Society by his death will be keenly felt, not only by Scottish members, but also by all those who attended the annual meeting of 1927, held at Edinburgh under his chairmanship.

Many Manchester chemists will hear with regret of the death of Mr. A. F. Edwards, who served as steward, and for many years as senior steward, in the Department of Chemistry of Manchester University for a total of 44 years. During this time he was associated with a number of famous chemists, including Perkin, Dixon, Robinson, and Lapworth, and was respected by these and many other chemists for his efficient work and his interest in the welfare of the University.

Mr. J. H. Stevens, a pioneer in the celluloid manufacturing industry, and author of many papers on celluloid, has died in America at the age of 80. Mr. Stevens began experimenting as long ago as 1869, and was the first assistant to J. W. Hyatt, the discoverer of the process for manufacturing celluloid. He was for some years general manager of the Celluloid Corporation, and held more than seventy patents for improvements in celluloid manufacture.

We regret to record the death on December 21 of Mr. W. I. Clark, D.Sc., F.R.S.E., senior partner of Duncan, Flockhart & Co., manufacturing chemists of Edinburgh and London.

Lt.-Col. G. D. Shaw has retired from the post of honorary secretary of the South Australian branch of the Australian Institute of Chemistry, which he had held for 13 years.

We regret to record the death in Paris on December 21 of Dr. Georges Haret, the noted radiologist. Dr. Haret's work with X-rays dated back to the days when little was known of their dangerous effects. He underwent many operations, but continued his work until his death. He was awarded the Cross of Officer of the Legion of Honour in February this year.

We regret to announce the death of Mr. H. F. Marshall, the noted electrical engineer. Mr. Marshall was born in America, and was at one time associated with Edison in the Edison General Electric Co., before coming to this country towards the end of last century. As a consultant he supervised many important installations in this country and was responsible for the design of the three-phase rotary convertor system first employed by the Central London Railway in 1913.

The death has occurred of Mr. W. W. Duffield, F.C.S., who was gas analyst to the City of London for more than 50 years.

Mr. F. E. Elmore, the metallurgist, who died in July last, left estate of gross value £56,382, with net personalty £49,185.

New Year Honours List

The following names appear in the New Year Honours List:—*Knights:* R. S. Rait, C.B.E. (Principal and Vice-Chancellor of Glasgow University since 1929); Prof. F. T. G. Hobday, C.M.G. (Principal of Royal Veterinary College); H. H. Dalrymple-Hay, M.Inst.C.E. (Consulting Engineer). *G.C.M.G.:* Sir H. J. Wilson, K.C.B., C.B.E. (Chief Industrial Advisor to H.M. Government in the United Kingdom). *C.M.G.:* W. J. U. Woolcock, C.B.E. (Chairman of Non-Official Advisors Committee associated with the U.K. Delegation to the Ottawa Conference). *K.B.E.:* Sir G. C. Vyle (Past President of Association of British Chambers of Commerce). *C.B.E.:* J. T. Piggott, O.B.E. (Manager, British Steel Export Association); Prof. H. E. Whitfield (Vice-Chancellor of University of Western Australia); F. H. A. Marshall, D.Sc., F.R.S. (Reader in Agricultural Physiology, Cambridge University); S. W. Smith, D.Sc. (President of the Institution of Mining and Metallurgy). *O.B.E.:* A. V. Elsden, M.B.E. (War Department Chemist, Royal Arsenal, Woolwich).

Bureau of Chemical Abstracts

During the nine years of its existence the Bureau of Chemical Abstracts has been most fortunate in having as its chairman Prof. J. C. Philip, who has given to his task that whole-hearted energy for which he is so well known. Thanks to his tactful advocacy in the Councils of the Chemical Society and the Society of Chemical Industry, he has succeeded in securing the utmost possible co-ordination between the two sets of abstracts, although it has always been a matter of regret to him that economic considerations have prevented the production of the Abstracts in both Pure and Applied Chemistry as one volume. Unfortunately for the

Bureau, Prof. Philip's outstanding powers of organization have recently become increasingly in request by the University of London, and he has accordingly found it essential to relinquish his position as chairman of the Bureau as from the end of 1932. The two Societies are, however, fortunate in that Prof. G. T. Morgan has consented, despite his many other responsibilities, to undertake the chairmanship. No one could be better fitted than Prof. Morgan to fill the position, since in addition to being fully conversant with the work of the Bureau (he has been a member since its inception) he brings to his task a long experience of the practical side of chemical publication.

Import Duties Advisory Committee

The Import Duties Advisory Committee gives notice of applications for the addition of the following goods to the Free List: ferro-chrome, cobalt metal, nickel metal in the form of pellets, cubes, rondels, etc., and refined ferro-manganese containing less than 3% of carbon.

The Committee further gives notice of applications for drawback under Section 9 of the Finance Act, 1932, in the case of the following: metallic ammunition in respect of the cupro-nickel or gilding-metal coated steel cups used in its manufacture, and hollow mining drill steel in respect of the billets of Acid Siemens Martin charcoal steel used in its manufacture.

Representations in regard to these applications should be addressed to the Secretary, Import Duties Advisory Committee, Caxton House, Tothill Street, S.W.1, not later than January 11, 1933.

The Committee announces that it has decided not to make any recommendation in respect of the application previously advertised for the addition of citrate of lime to the Free List.

American Institute of Chemical Engineers

The American Institnte of Chemical Engineers has re-elected Dr. J. Van Nostrand Dorr as president for the ensuing year, and Mr. A. E. Marshall continues as vice-president.

British Standards Institution

The Institution has recently issued in the form of a handy booklet the report presented at the last annual general meeting, and with it is incorporated an indexed list of the British Standard Specifications. The report contains a good deal of interesting information dealing with the work of the three divisions of the Institution—Engineering, Building, and Chemical. The indexed list includes a subject index and a numerical list of the B.S. Specifications. Copies of this pnblication can be obtained from the Publications Department of the Institution, 28, Victoria Street, S.W.1, price 1s. 2d., post free.

Structural Materials Investigation

Imperial Chemical Industries, Ltd., and the British Steelwork Association are collaborating in setting up a committee to investigate the adaptation of modern methods of design and materials in the production of inexpensive and efficient structures.

European Rayon Cartel

Negotiations have been proceeding for some time between the German, French, and Belgian producers of rayon, and the result of these is that the French viscose manufacturers belonging to the Centrale des Produits de Soie Artificielle, and the Belgian members of the "Fabelta," will this year join the German Viscose Syndicate, regulating sales in the German market. Dutch, Italian, and Swiss interests are already represented in the German Syndicate.

Notes from India

Bakelite manufacture in Bombay.—A hard insulating material similar to Bakelite is now being manufactured in Bombay at the Indian Electrical Accessories Press Works under the direction of a German engineer named Gorris. At present the process is being worked on a very small scale, but it appears to have considerable possibilities.

Wood preservation.—A new process for the preservation of wood has recently been developed as a result of work at the Forest Research Institute at Dehra Dun, India. It has been found that whilst arsenic and chromium compounds applied separately for impregnating wood are soon washed out, when used together they are retained by the wood for much longer periods, and such a mixture is very efficient in preventing the attacks of wood fungi and insects.

Nitrogen Production and Consumption

The annual report of the British Sulphate of Ammonia Federation is always interesting, but especially so this year in view of the many significant changes which are taking place with regard to the production and consumption of "manufactured nitrogen." During the year under review, ended June 30, 1932, it is estimated that there was a decrease of 140,584 metric tons, or 8·3%, in the production of manufactured nitrogen, and for the first time for five years' consumption was ahead of production. In Chile alone there was a reduction of 80,000 t., or 32% of the last year's output. Exclusive of Chile, the world's nitrogen production capacity is put at 3,400,000 t., and during this last year only 42% of this capacity was utilized. The consumption during the year again fell slightly, but the cause of this was the reduced interest in Chilean nitrate, other forms of manufactured nitrogen showing an increased consumption. "Synthetic" nitrogen showed a marked advance in production during the year, and the pre-eminent position which this nitrogen now occupies in industry is shown by the fact that the year's ontput of 519,120 t. was nearly double that of by-product nitrogen, whereas in the year 1929—30 the two forms were produced in approximately equal amounts. England and a number of other European countries consumed increased quantities of nitrogen, but Germany, the U.S.A., Java, and China were notable for reduced consumption. In England the most notable feature was the increase of 37·6% in the consumption of sulphate of ammonia, much of which has no doubt been due to the excellent propaganda carried out by the Federation, and to the extension of the knowledge on the manuring of grassland as a result of the good work which is being done at Jealott's Hill. It is interesting to note that although agreement was reached during the year to effect the co-operation of the principal European producers, it is stated that the nitrogen market will remain liable to the risk of violent price fluctuations until more permanent arrangements are arrived at.

REVIEWS

The B.D.H. Book of A.R. Standards. 2nd and revised edition. Pp. xii + 194. London: British Drug Houses, Ltd., 1932. 2s. 6d.

During the war, when the supply of German analytical reagents was cut off, a joint committee of the Institute of Chemistry and the Society of Public Analysts was formed to issue a list of specifications of purity for 88 analytical reagents. The B.D.H. book, which was first published six years ago, represented a very creditable effort to continue this work in the light of changes brought about since the war, and in the absence of an official list of standards the book was welcomed by many analytical chemists. It is of interest therefore to note that a second edition of the work has now been published. In six years many changes have taken place, and the B.D.H. Book of A.R. Standards now deals with 208 reagents, whilst the monographs with regard to each contain lists of maximum permissible limits of impurity. The book aims at defining as exactly as possible the commercially obtainable standards for those chemicals of which purity is of first importance—for those chemicals, in fact, which are usually flattered by the description "chemically pure." Such a task is no small one, and British Drug Houses have achieved an excellent work of reference. The book is well printed and has the merit of being not burdened with advertising matter, and with its 200 pages at a cost of 2s. 6d. is good value for money. Of its usefulness there should be no doubt, and it will be a useful addition to the libraries of many analytical laboratories.

Supply of Water. By T. H. P. Veal, B.Sc. Pp. viii + 242. London: Chapman & Hall, Ltd., 1931. 15s.

Although the author carefully points out that this book is primarily intended for students and young waterworks engineers, yet it contains chapters which have a much wider field, such as the first, which deals with the principal sources of water, the second, relating to wells and their theoretical yields, and the final chapters, in which are considered the classification of impurities, hardness, alkalinity or acidity, bacteria and algæ, and the methods and plants used for softening, filtering, and sterilizing water for both domestic and industrial use.

As very many chemical works obtain their supplies from existing distributing systems, rivers, or wells, and as the water has often to undergo treatment after entering the factory, the portions of the book outlined above will prove more useful to those in control of such supplies than the sections relating to the drilling of wells and the design and construction of dams, embankments, and reservoirs.

Other chapters dealing with the measurement of flow in open and closed ducts, channels, pipes, and the various water meters, valves, and other fittings which are required on a distribution scheme, should be of interest and use to the factory engineer. Such readers may expect a clear and practical treatment of the subject, and the bibliography provided will enable those who wish, to pursue any section of the subject in greater detail. The book is well illustrated and indexed.

COMPANY NEWS

JOSEPH NATHAN & CO., LTD.

The directors of this company which manufactures "Glaxo" and other proprietary articles, state that preliminary information indicates that the profit for the year ended September 30 will be £21,531, as against £52,137 last year. The report and accounts are to be issued in March next year. The trading and manufacturing conditions in New Zealand, and the depression in all export markets, are the causes to which the drop in profit is attributed.

UNITED INDIGO AND CHEMICAL CO., LTD.

The interim dividend of 2½% has been declared on the participating cumulative preference shares for the six months ending December 31, 1932.

POWER GAS CORPORATION, LTD.

At the ordinary general meeting of the company held on December 14, it was stated that the reduced dividend of 4% as compared with 6% last year was not due to any falling off in profits, but to the fact that the amount brought forward was nearly £6000 less. A number of outstanding contracts had been executed during the year, notably the construction of the blast furnace plant for the Ford Motor Co., the rebuilding of the plant of the British Iron & Steel Co., Ltd., and the construction of plant for South Africa. During the year the company had taken over from Imperial Chemical Industries, Ltd. the manufacture of welded steel tubes known as "Fista" poles for low-temperature distribution lines.

COSACH

The report of Cosach, presented at a general meeting at Santiago on December 30, shows that the big Chilean nitrate combine sustained a loss during the year ended June 30, 1932, of 110,020,805 Chilean gold pesos, equivalent to about £2,750,520, reducing the capital reserve to 5,685,518 gold pesos, or £142,137. A decree has since been issued by the President of the Republic for the legal liquidation of the combine. It has been stated that reorganization is to follow, with the formation of a new company to replace Cosach, with a capital of 1,400,000,000 gold pesos, or £35,000,000. The Minister of Finance has signed a request to Parliament for authority to borrow 138,000,000 gold pesos (£3,450,000) from the Banco Centrale de Chile for the redemption of Cosach shares. It will be remembered that Cosach (Compania de Salitre de Chile) was formed early in 1931 with a capital of £75,000,000, to combine all the interests in the marketing of nitrate products. Half of the capital was owned by the Chilean Government.

TRANSPARENT PAPER, LTD.

The annual report of this company, which was formed in 1928 to manufacture transparent paper in a factory at Bury, shows a profit for the year ended September 30 of £9004, as against a loss last year of £27,006. Since the last report of the company the paid-up capital has been reduced from £328,100 to £161,480, and a number of dead items have been eliminated from the balance sheet, including preliminary expenses £39,980, and development account £42,569.

MARKET REPORT

This Market Report is compiled from special information received from the manufacturers concerned.

Unless otherwise stated, the prices quoted below cover fair quantities net and naked at sellers' works.

GENERAL HEAVY CHEMICALS

Acid, Acetic, 40% tech.—£19 15s. per ton d/d address U.K. in casks.

Acid, Chromic.—11d. per lb., less 2½% d/d U.K.

Acid, Hydrochloric.—Spot, 3s. 9d.—6s. per carboy d/d according to purity, strength, and locality.

Acid, Nitric 80° Tw.—Spot, £18—£20 per ton makers' works, according to district and quality.

Acid, Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia (Anhydrous).—Spot, 10d. per lb. d/d in cylinders.

Ammonium Bichromate.—8d. per lb., d/d U.K.

Bisulphite of Lime.—£6 10s. per ton f.o.r. London, packages free.

Bleaching Powder, 35/37%.—Spot, £8 15s. per ton d/d station in casks, special terms for contracts.

Borax, Commercial.—Granulated, £15 10s. per ton; Powder, £17 per ton. (For 1-ton lots and upwards, packed in 1-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chloride, Solid, 70/75%.—Spot, £5 5s.—£5 15s. per ton d/d station in drums.

Chrometan.—Crystals, 3¾d. per lb.; Liquor, £19 10s. per ton d/d U.K.

Chromium Oxide.—10d.—10½d. per lb., according to quantity, d/d U.K.

Methylated Spirits, 61 O.P.—Industrial, 1s. 8d.—2s. 3d. per gal.; Pyridinized Industrial, 1s. 10d.—2s. 5d. per gal.; Mineralized, 2s. 9d.—3s. 3d. per gal. 64 O.P. 1d. extra in all cases. Prices according to quantity.

Nickel Sulphate.—£54 per ton d/d.

Nickel Ammon. Sulphate.—£54 per ton d/d.

Potash, Caustic.—£30—£33 per ton. Potass. Bichromate crystals and granular.—5d. per lb., net d/d U.K., for spot. Discount according to quantity. Ground 5⅝d. per lb. Potass. Chlorate.—3⅞d. per lb. ex whf. Lond. in cwt. kegs.

Potassium Chromate.—6½d. per lb., d/d U.K.

Sal ammoniac, Firsts lump.—Spot, £42 17s. 6d. per ton d/d address in barrels. Chloride of Ammonia.—£37—£45 per ton, carr. paid.

Salt Cake, unground.—Spot, £3 15s. per ton d/d station in bulk.

Soda Ash, 58° E.—Spot, £6 per ton, f.o.r. in bags, special terms for contracts.

Soda, Caustic, solid 76/77° E.—Spot, £14 10s. per ton d/d station in drums, special terms for contracts.

Soda crystals.—Spot, £5—£5 5s. per ton d/d station or ex depôt in 2-cwt. bags.

Sod. Acetate 97/98%.—£21 per ton. Sod. Bicarbonate (refined).—Spot, £10 10s. per ton d/d station in bags. Sod. Bichromate Crystals, Cake, and Powder.—4d. per lb., net d/d U.K., discount according to quantity. Anhydrous 5d. per lb. Sod. Bisulphite Powder 60/62%.—£16 10s. per ton delivered, 1-cwt. iron drums for home trade.

Sodium Chromate.—3½d. per lb., d/d U.K.

Sod. Phosphate.—£13 per ton, f.o.r. London, casks free. Sod. Silicate 140° Tw.—Spot, £8 5s. per ton d/d station returnable drums. Sod. Sulphate (Glauber's Salt).—Spot, £4 2s. 6d. per ton d/d. Sod. Sulphide solid, 60/62%.—Spot, £10 15s. per ton, d/d in drums. Crystals, 30/32%.—Spot, £7 15s. per ton, d/d in casks. Sod. Sulphite, Pea Cryst.—Spot, £13 10s. per ton, d/d station in kegs; Commercial.—Spot, £9 10s. per ton, d/d station in bags.

RUBBER CHEMICALS

Antimony Sulphide.—Golden.—6½d.—1s. 1½d. per lb., according to quality. Crimson.—1s. 3d.—1s. 5d. per lb., according to quality.

Arsenic Sulphide, Yellow.—1s. 6d.—1s. 8d. per lb.

Barytes.—£7 10s.—£9 per ton, according to quality.

Cadmium Sulphide.—3s. 1d.—3s. 5d. per lb.

Carbon Bisulphide.—£30—£32 per ton, according to quantity, drums extra.

Carbon Black.—3⅝d.—5¼d. per lb., ex wharf.

Carbon Tetrachloride.—£40—£45 per ton, according to quantity, drums extra.

Chromium Oxide, Green.—1s. 2d. per lb.

Diphenylguanidine.—2s. 4d. per lb.

India-rubber Substitutes, White.—4¼d.—4⅞d. per lb. Dark.—3½d.—4¼d. per lb.

Lamp Black.—£46—£50 per ton.

Lead Hyposulphite.—9d. per lb.

Lithopone, 30%.—£18—£19 per ton.

Mineral Rubber "Rupron."—£18 10s. per ton.

Sulphur.—£12 per ton. Sulphur Precip. B.P.—£55—£60 per ton. Sulphur Precip. Comm.—£50—£55 per ton.

Sulphur Chloride.—5d.—7d. per lb., according to quantity.

Vermilion, pale or deep.—4s. 6d.—4s. 11d. per lb.

Zinc Sulphide.—1s.—1s. 2d. per lb., according to quality.

WOOD DISTILLATION PRODUCTS

Acetate of Lime.—Brown, £8 10s.—£8 15s. per ton. Grey, £10 10s.—£12 per ton. Liquor, Brown, 30° Tw., 6d. per gal.

Acetic Acid, technical, 40%.—£16 10s.—£18 per ton.

Amyl Acetate, technical.—95s.—110s. per cwt.

Charcoal.—£6—£11 per ton, according to grade and locality.

Methyl Acetone, 40/50%.—£50—£52 per ton.

Wood Naphtha.—Miscible.—2s. 7d.—4s. per gal. Solvent, 3s. 9d.—4s. 9d. per gal.

Wood Tar.—£2—£6 per ton.

Wood Creosote.—6d.—2s. per gal.

TAR PRODUCTS

Acid Carbolic.—Crystals.—9d.—10d. per lb. Crude 60's, 2s.—2s. 1d., 2% water, 2s. 5d. per gal.

Acid Cresylic, 99/100.—1s. 7d.—1s. 8d. per gal. B.P., 1s. 9d.—1s. 11d. per gal. Refined, 1s. 7d.—1s. 9d. per gal. Pale, 98%, 1s. 5d.—1s. 7d. per gal. Dark, 1s. 2d.—1s. 3d. per gal.

Anthracene Oil, Strained, 4¾d. per gal.

Benzole.—Prices at works: Crude, 10½d.—11d. per gal.; Standard motor, 1s. 6½d.—1s. 7d. per gal.; 90%, 1s. 7d.—1s. 8d. per gal.; Pure, 1s. 10d.—1s. 11d. per gal.

Xylol.—1s. 10d.—2s. per gal. Pure, 1s. 11d.—2s. 2d.

Creosote.—Standard specification, for export, 4½d.—5d. net per gal., f.o.b. For home, 3¾d. per gal., d/d.

Naphtha.—Solvent 90/160, 1s. 4d.—1s. 6d. per gal. Solvent 95/160, 1s. 7d.—1s. 8d. per gal. Solvent 90/190, 11d.—1s. 2d. per gal.

Naphthalene.—*Purified crystals*, £9 10s. per ton in bags. Crude, Hot Pressed, £6 5s. per ton. Flaked, £11 *per ton*.

Pitch, medium, soft.—97s. 6d.—100s. per ton, in bulk at makers' works.

Pyridine.—90/140—3s. 9d. per gal.; 90/160—4s.—4s. 6d. per gal.; 90/180—2s.—2s. 3d. per gal.

Toluole.—90%, 1s. 10d.—2s. 1d. per gal. Pure, 2s. 3d.—2s. 5d. per gal.

PHARMACEUTICAL AND PHOTOGRAPHIC MATERIALS

Acid, Acetic, Pure 80%.—£38 5s. per ton d/d address U.K. in casks.

Acid, Acetyl Salicylic.—2s. 9d.—2s. 11d. per lb., according to quantity.

Acid, Benzoic, B.P.—1s. 9d.—1s. 11d. *per* lb. *Solely* ex Gum.—1s. 3d.—1s. 6d. per oz.; 50-oz. lots, 1s. 3d. per oz.

Acid, Boric, B.P.—Cryst., £35 10s. per ton. Powder, £36 10s. per ton. Ex-Fine Powder, £38 10s. per ton. For 1-ton lots and upwards, packed in 1-cwt. bags, carriage paid any station in Great Britain.

Acid, Camphoric.—19s.—21s. per lb.

Acid, Citric.—10d. per lb. Less 5%

Acid, Gallic.—2s. 9d. per lb. for pure crystal in 1-cwt. lots.

Acid, Molybdic.—5s. 3d.—5s. 9d. per lb., according to quantity.

Acid, Pyrogallic. Cryst.—6s. 9d. per lb. for 1-cwt. lots. Resublimed.—8s. 6d. per lb. for 28-lb. lots d/d.

Acid, Salicylic.—B.P. pulv., 1s. 7d.—1s. 10d. per lb. *Technical, 1s. 2d.—1s. 4d. per lb.*

Acid, Tannic, B.P.—3s. 2d.—3s. 6d. per lb.

Acid, Tartaric.—10¾d. per lb. Less 5%.

Acetanilide.—1s. 5d. per lb.

Amidopyrin.—19s. 6d. per lb.

Ammon. Benzoate.—3s. 3d. per lb.

Ammon. Carbonate, B.P.—Lump, £36 per ton. Powder, £39 per ton, in 5-cwt. casks. Resublimed, 1s. per lb.

Ammonium Hippurate.—19s. 6d.—23s. 6d. per lb.

Ammonium Iodide.—17s.—17s. 6d. per lb.

Ammonium Molybdate.—5s.—5s. 6d. per lb., according to quantity.

Argent. Nitras, Crystal.—1s. 1d. per oz.

Arsenic Iodide.—22s. 6d.—25s. per lb.

Benzonaphthol.—3s. 3d.—3s. 9d. per lb.

Berberine, Hydrochloride.—5s. 6d.—6s. per oz.; Sulphate, 5s. 6d.—6s. per oz.

Bismuth Salts.—Carbonate, 7s. 1d. per lb.; Citrate, 9s. 7d. per lb.; Nitrate (cryst.), 4s. 9d. per lb.; Oxide, 10s. 11d. per lb.; Salicylate, 7s. 11d. per lb.; Subchloride, 10s. 8d. per lb.; Subgallate, 7s. 7d. per lb.; Subnitrate, 6s. 1d. per lb. Above for cwt. lots. Extra and reduced prices for smaller and larger quantities respectively. Liquor Bismuthi, P.B., in W. Qts.—1s. 1½d. per lb.; 6 W. Qts.—11d. per lb.; 12 W. Qts.—9½d. per lb.; 36 W. Qts.—9d. per lb.

Borax, B.P.—Crystal, £24 10s. per ton. Powder, £25 per ton. For 1-ton lots and upwards, packed in 1-cwt. bags, carr. paid any station in Great Britain.

Bromides, B.P.—Ammonium.—1s. 10d. per lb. Potassium.—1s. 7d. per lb. Sodium.—1s. 9d. per lb. Prices for 1-cwt. lots.

Cadmium Iodide.—17s. 6d.—18s. per lb.

Calcium Hippurate.—26s.—30s. per lb.

Calcium Iodide.—20s. per lb.

Calcium Lactate, B.P.—1s. 2d.—1s. 4d. per lb., according to quantity.

Camphor.—Refined flowers, 3s. 1d.—3d. 3d. per lb. Transparent tablets, 3s. 4d.—3s. 6d. per lb., *according to quantity; also special contract prices.*

Chloroform.—2s. 3d.—2s. 8d. per lb.

Cocaine, Alkaloid and Citrate.—For export.—29s. 10d. —31s. 7d. per oz. Hydrochloride and Nitrate, 27s. 1d.—28s. 11d. per oz.

Ergosterol.—2s. 6d. per gm.

Ethers.—S.G. 730, 1s. 1d.—1s. 2d. per lb., according to quantity, and other prices according to specific gravity.

Hexamine.—2s. 6d.—2s. 10d. per lb., according to quantity.

Hippuric Acid.—17s. 6d.—21s. 6d. per lb.

Hydrogen Peroxide (12 vols.).—1s. 4d. per gal., f.o.r. makers' works, naked. B.P.—10 vols., 2s.—2s. 3d. per gal.; 20 vols., 3s. per gal.

Hydroquinone.—4s. 10½d.—5s. 3d. per lb.

Hypophosphites.—Calcium, 2s. 9d.—3s. 2d. per lb. Potassium.—3s.—3s. 5d. per lb. Sodium, 2s. 11d. —3s. 4d. per lb.

Iodine Resub., B.P.—15s. 7d.—19s. 8d. per lb.

Iodoform, *B.P.*, *Cryst.*, *Precip. or Powder.—18s. 9d.*—22s. 9d. per lb.

Iron Ammon. Citrate.—B.P.—1s. *7d. per lb. for 28-lb.* lots. Green, 2s. 6d. per lb. (list price).

Iron Iodide.—17s. 6d.—18s. per lb.

Iron Perchloride.—18s.—20s. per cwt., according to quantity.

Iron Quinine Citrate, B.P.—9½d.—10d. per oz., according to quantity.

Lead Iodide.—14s.—15s. per lb.

Lithium Carbonate, B.P. 1914.—5s. 4d. per lb.

Lithium Chloride, Cryst.—8s. 3d. per lb.

Lithium Citrate.—5s. 3d. per lb. Powder.—5s. 6d. per lb.

Lithium Hippurate.—18s. 6d.—22s. 6d. per lb.

Lithium Iodide.—20s. 6d.—21s. 6d. per lb.

Magnesium Carbonate.—Light, 28s. per cwt.

Magnesium Oxide.—Light, 70s. per cwt.; Heavy, 1s. 8d. per lb.; in quantity lower.

Menthol.—A.B.R., recryst., B.P., 18s. 6d. per lb. net. Synthetic, 8s. 6d.—12s. per lb. Synthetic detached crystals, 8s. 6d.—10s. per lb., according to quantity; Liquid (95%), 8s. 6d. per lb.

Mercurials, B.P.—Red oxide crystals, 5s. 10d.—5s. 11d. per lb.; Levig, 5s. 4d.—5s. 5d. per lb.; Corrosive sublimate, Lump, 4s.—4s. 1d. per lb.; Powder, 3s. 8d.—3s. 9d. per lb.; White precip., Lump, 4s. 9d.—4s. 10d. per lb.; Powder, 4s. 11d.—5s. per lb.; Calomel, 4s. 9d.—4s. 10d. per lb. Yellow Oxide, 5s. 2d.—5s. 3d. per lb.; Persulph., B.P.C., 4s. 11d.—5s. per lb.; Sulph. nig., 4s. 10d.—4s. 11d. per lb. Special prices for larger quantities.

Mercury, Benzoate.—8s. 3d. per lb.; Cyanide, 12s. 7d.—*13s. 1d. per lb.; Oleate (5%), 1s. 11d.—2s. 2d. per* lb.; (10%), 2s. 9d.—3s. per lb.; (20%), 3s. 9d.—4s. per lb. Protonitras, 6s. 9d. per lb.; Protosulphate, 7s. 3d. per lb.; Subsulphate flav., 7s. 1d. per lb.

Methyl Salicylate.—1s. 4½d.—1s. 6½d. per lb.

Paraformaldehyde.—1s. 3d.—1s. 5d. per lb.

Paraldehyde.—1s. 1d. per lb.

Phenacetin.—3s. 10d.—4s. 6d. per lb.

Phenolphthalein.—3s. 10d.—4s. 6d. per lb.

Potass. Bitartrate.—99/100% (Cream of Tartar), 87s. per cwt., less 2½%.

Potass. Citrate.—B.P., 1s. 5d. per lb. for 28-lb. lots.

Potass. Ferricyanide.—1s. 7½d. per lb., in 125-lb. kegs

Potass. Iodide, B.P.—13s. 10d.—16s. 4d. per lb., according to quantity.
Potass. Permanganate.—8½d. per lb. for 1-ton lots.
Potass. Metabisulphite.—50s. per cwt. d/d London, kegs free.
Potassium Hippurate.—26s.—30s. per lb.
Quinine Sulphate.—2s. 6d. per oz., for 100-oz. tins, tins free.
Saccharin.—37s. 6d. per lb., and lower in quantity.
Salicin.—15s.—16s. per lb., according to quantity.
Santonin.—£50 per kilo for 5-kilo lots.
Seidlitz powder (pulv.).—66s. 3d.—70s. per cwt.
Silver Nitrate.—1s. 3½d. per oz. for quantity. Sticks, 2d. per oz. extra.
Sod. Barbitonum.—12s. 9d.—14s. per lb.
Sod. Benzoate, B.P.—1s. 7d. per lb., according to quantity.
Sod. Citrate, B.P.C., 1911.—1s. 2d. per lb. B.P.C., 1923, and U.S.P.—1s. 6d. per lb. for 28-lb. lots.
Sodium Hippurate.—23s. 6d.—27s. 6d. per lb.
Sod. Hyposulphite.—Photographic, £15 per ton d/d consignee's station, in 1-cwt. kegs.
Sodium Iodide, B.P.—14s. 10d.—17s. 11d. per lb.
Sod. Nitroprusside.—16s. per lb.
Sod. Potass. Tartrate (Rochelle Salt).—75s. per cwt. net for 1-ton lots. Crystals, 2s. 6d. per cwt. extra.
Sod. Salicylate.—Powder, 2s.—2s. 8d. per lb. Crystal, 2s. 1d.—2s. 9d. per lb.
Sod. Sulphide.—Pure recryst., 10d.—1s. 2d. per lb.
Sod. Sulphite anhydrous.—£23—£25 per ton, according to quantity, d/d U.K.
Strontium Iodide.—17s. 6d. per lb.
Tartar Emetic B.P. cryst. or powder.—1s. 9d.—2s. per lb.
Terpine hydrate.—1s. 2d.—1s. 5d. per lb.
Thymol, Puriss.—5s. 9d.—6s. 6d. per lb., according to quantity. Natural.—12s. per lb.
Zinc Iodide.—21s.—22s. per lb.
Zinc Stearate.—1s. 4d.—1s. 6d. per lb.

PERFUMERY CHEMICALS

Acetophenone.—7s. per lb.
Aubepine (*ex Anethole*).—8s. 9d. per lb.
Amyl Acetate.—2s. 3d. per lb. Amyl Butyrate.—5s. per lb. Amyl Cinnamic Aldehyde.—8s. 6d. per lb. Amyl Salicylate.—2s. 9d. per lb. Anethol, 21/22° C., 5s. 3d. per lb.
Benzaldehyde free from Chlorine.—3s. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—1s. 9d. per lb. Benzyl Alcohol free from Chlorine.—1s. 9d. per lb. Benzyl Benzoate, 2s. 1d. per lb.
Cinnamic Aldehyde.—Natural, 12s. 6d. per lb.
Citronellol.—8s. 6d. per lb.
Citral.—6s. 6d. per lb.
Coumarin.—14s. 6d. per lb.
Ethyl Cinnamate.—7s. 6d. per lb.
Ethyl Phthalate.—2s. 6d. per lb.
Eugenol.—7s. 6d. per lb. Geraniol (Palmarosa).—17s. 3d. per lb. *Geraniol.—6s. 6d.—11s. per lb.* Heliotropine.—5s. 9d. per lb. Iso Eugenol.—9s. per lb. Linalol.—(*ex Bois de Rose*) 7s. per lb.—(*ex Shui Oil*) 6s. per lb. Linalyl Acetate.—(*ex Bois de Rose*) 9s. per lb.—(*ex Shui Oil*) 7s. 6d. per lb.
Methyl Anthranilate.—8s. 6d. per lb.
Methyl Benzoate.—4s. 3d. per lb.
Musk Ketone.—30s. per lb.
Musk Xylol.—6s. 6d. per lb.
Nerolin.—4s. per lb.
Phenyl Ethyl Acetate.—10s. per lb.
Phenyl Ethyl Alcohol.—8s. 6d. per lb.
Rhodinol.—60s. per lb. Safrol.—1s. 7d. per lb. Terpeneol.—1s. 6d. per lb. Vanillin (*ex Clove Oil*).—16s.—18s. per lb.—(*ex Guaiacol*)—14s. 3d.—16s. 3d. per lb.

ESSENTIAL OILS

Almond.—Foreign S.P.A., 11s. 6d. per lb. Anise.—2s. 2d. per lb. Bergamot.—8s. 6d. per lb. Bourbon Geranium, 24s. 6d. per lb.
Camphor.—Brown, 80s. per cwt. White, 85s. per cwt. Cananga, Java, 11s. per lb. Cinnamon Oil.—4s. 3d. per lb. Cassia, 80/85%, 4s. 9d. per lb.
Citronella Oil.—Java, 3s. per lb. Ceylon, 2s. 6d. per lb. *Clove—90/92% English, 5s. per lb.*
Eucalyptus, Australian B.P., 70/75%.—1s. 1d. per lb. Lavender.—Mont Blanc, 38/40%.—10s. 6d. per lb. Lemon—6s. per lb. Lemongrass—3s. per lb. Orange, Sweet.—6s. 6d. per lb. Otto of Rose.—Anatolian, 42s. 6d. per oz.; Bulgarian, 62s. 6d. per oz. Palma Rosa, 10s. per lb.
Peppermint.—Japanese, 6s. 9d. per lb. Wayne County, 14s. 6d. per lb. Petitgrain.—6s. per lb.
Sandalwood, Mysore, 30s. per lb. 90/92%, 19s. 3d. per lb.

INTERMEDIATES

Items marked thus * d/d buyers' works.

*Acid, Benzoic, 1914 B.P. *ex Toluol*.—1s. 9½d. per lb. in casks.
*Acid Gamma.—Spot, 4s. per lb., 100%.
*Acid H.—Spot, 2s. 4½d. per lb., 100%.
*Acid Neville and Winther.—Spot, 3s. per lb., 100%.
*Acid Sulphanilic, 8d. per lb.
*Aniline Oil, spot, 8d. per lb., drums extra.
*Aniline Salts, spot, 8d. per lb., casks free.
*Benzaldehyde, spot, 1s. 8d. per lb., packages extra.
*Benzidine Base.—Spot, 2s. 5d. per lb., 100%.
o-Cresol 30/31° C.—£2 6s. 5d. per cwt. in 1-ton lots.
m-Cresol 98/100%.—2s. 3d. per lb., in ton lots.
p-Cresol 34.5° C.—1s. 9d. per lb., in ton lots.
Dichloraniline.—2s. per lb.
*Dimethylaniline.—Spot, 1s. 6d. per lb., packages extra.
Dinitrobenzene.—8½d. per lb.
Dinitrotoluene 48/50° C.—8½d. per lb. 66/68° C.—9d. per lb.
*Diphenylamine.—Spot, 2s. per lb.
*α-Naphthol.—Spot, 2s. 4d. per lb.
*β-Naphthol.—Spot, £75 per ton, in 1-ton lots.
*α-Naphthylamine.—Spot, 11½d. per lb.
*β-Naphthylamine.—Spot, 2s. 9d. per lb.
o-Nitraniline.—5s. 10d. per lb.
**m*-Nitraniline.—2s. 7d. per lb.
**p*-Nitraniline.—Spot, 1s. 8d. per lb.
*Nitrobenzene.—Spot, 5d. per lb., 5-cwt. lots, drums extra.
Nitronaphthalene.—9d. per lb.
*Sodium Naphthionate.—Spot, 1s. 9d. per lb., 100%.
**p*-Toluidine.—Spot, 1s. 11d. per lb.
**o*-Toluidine.—Spot, 9½d. per lb., drums extra.
m-Xylidine acetate, 3s. 6d. per lb., 100%.

GENERAL NOTES

Official Trade Intelligence

The Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1, has received the following inquiries for British goods. British firms may obtain further information by applying to the Department and stating the specific number. ***Brazil:*** Tinplate (893). ***British India:*** Paint,

varnish (870 c.). *Canada:* Copper screen plates (G.X. 12,137).

The "Chemical Age" Year Book

At this time of the year a number of year books make their appearance, and the first one to hand is one well known to chemists, the "Chemical Age" Year Book for 1933. That this publication is now in its eleventh year is sufficient evidence that it has been found useful, and the 1933 is likely to be found no less interesting to chemists than its forbears. The book comprises some 150 pages, and the diary which is included is of sensible layout and proportions, the only criticism which is likely to be made being that, for purposes of easy reference, it should have been kept to one end of the book, instead of being hampered on the one side by advertising matter, and on the other by the "Literary Contents." These latter contain much concise reference material relative to chemical and allied organizations, research organizations and officials, publications, and physico-chemical tables, all of which will be of use to industrial chemists and manufacturers.

Chocolate and Confectionery

A book that will appeal to those concerned with the technique of food processing has recently been published by A. Boake, Roberts & Co., Ltd., with the title "A Handbook on Chocolate and Confectionery." Concise information is given, not only with regard to the materials employed, but also concerning the machinery for manufacture, the chemical and physical conditions necessary to ensure good products, and such practical points as the choice of fuel. The book is of handy size for the pocket and a feature which deserves praise is that the text has not been made the vehicle for advertising matter, which has been relegated to pages at the end of the book. Copies will be forwarded by this firm to actual manufacturing confectioners and chemists employed by the trade, who are interested.

Degussa Products

A useful brochure with the above title has been issued by Bush, Beach & Gent, Ltd., of Marlow House, Lloyd's Avenue, London, E.C.3. It reviews the ceramic treatment and employment of corundum, spinel, zirconium silicate and the oxides of beryllium, zirconium, magnesium and thorium, in the manufacture of crucibles, pyrometer protection tubes, etc. designed for high-temperature work.

Drayton Thermostatic Switches

The Drayton Regulator & Instrument Co., Ltd., of West Drayton, Middlesex, has recently issued leaflets dealing with two new and interesting thermostatic switches. The first deals with calibrated thermostatic switches, the operation point being adjustable against a calibrated scale by means of an external lever. These switches, unless otherwise specified, operate on the vapour pressure of a volatile liquid contained in a copper bulb connected to a multiple spiral bourdon tube, temperature adjustment being made by turning the whole bourdon tube round its axis. The temperature setting is indicated on a segmental dial. When required for The second leaflet deals with a thermostatic room switch, intended primarily for high capacity work, although a low capacity switch is supplied for applications where open metal contact switches are undesirable, *e.g.*, in damp and dusty rooms. Operation is by means of an extra long bi-metal spiral helically wound to expose a maximum area to the air. The switches can be supplied for both A.C. and D.C. current.

Industrial Equipment

Mining & Industrial Equipment, Ltd., report having received orders for the following equipment:

England: One LM. 7 Lopulco mill for grinding marl. Two Ro-Tap testing sieve shakers for testing. One Raymond air-separating plant for separating hydrated lime. *South Wales:* One 6-ft. × 36-in. conical mill for grinding anthracite. Two LM. 5a Lopulco mills for grinding anthracite. *Abroad:* One 4-ft. 6-in. × 16-in. conical mill for grinding mineral ore. *The Sudan:* One 3-ft. dia. conical mill for grinding friable quartz ore. *South America:* One 5-in. grit pump for gold ore, in conjunction with an Andrews classifier.

Electric Furnaces

An important development with regard to electric furnaces is indicated in the announcement that Wild-Barfield Electric Furnaces, Ltd., of London, and Birmingham Electric Furnaces, Ltd., have reached an agreement for the interchange of information and rights under their respective patents relating to electric furnaces employing centrifugal fans. Experiments with regard to fan furnaces are being carried out by both firms, and the joint results should be of considerable value to those manufacturers who are concerned with low-temperature operations such as the tempering of steel and the heat-treatment of aluminium alloys.

PUBLICATIONS RECEIVED

SOCIETY OF PUBLIC ANALYSTS AND OTHER ANALYTICAL CHEMISTS. SOME REMINISCENCES OF ITS FIRST FIFTY YEARS. By B. Dyer, D.Sc., and A REVIEW OF ITS ACTIVITIES by C. Ainsworth Mitchell, M.A., D.Sc. Pp. viii + 278. Cambridge: W. Heffer & Sons, 1932. 12s. 6d.

CHEMICAL ENGINEERING CATALOG, 1932. 17th annual ed. Pp. 847. New York: Chemical Catalog Co., 1932. $3.

INCUNABULA OF TANNIN CHEMISTRY. By M. Nierenstein. Pp. 167. London: E. Arnold & Co., 1932. 12s. 6d.

WATER POLLUTION RESEARCH. SUMMARY OF CURRENT LITERATURE. Vol. V, No. 12. December, 1932. Abstracts Nos. 1372—1482 and Index to Vol. V. Department of Scientific and Industrial Research. Pp. 399—516. London: H.M. Stationery Office, 1932. 2s.

INDUSTRIAL RESEARCH AND THE NATION'S BALANCE SHEET. By Sir Frank E. Smith, K.C.B., C.B.E., LL.D., D.Sc. Norman Lockyer Lecture, 1932. Pp. 31. London: British Science Guild, 1932. 1s.

CHEMIE UND KONTINENTALES PATENTRECHT. By Dr. E. Müller and others. Pp. 156. Berlin: Verlag Chemie, 1932. 8 rm.

REPORT ON BAND SPECTRA OF DIATOMIC MOLECULES. By W. Jevons, D.Sc. Physical Society. Pp. 308. Cam-